

**UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF TEXAS  
SAN ANTONIO DIVISION**

WAVE NEUROSCIENCE, INC. a Delaware Corporation,

Plaintiff,

vs.

BRAIN FREQUENCY LLC, a Texas Limited Liability Company

Defendant.

Case No. 5:23-CV-00626-XR

Honorable: Xavier Rodriguez

**DECLARATION OF MAROM BIKSON IN  
SUPPORT OF PLAINTIFF’S REPLY  
CLAIM CONSTRUCTION BRIEF**

1. I have been asked by Plaintiff Wave Neuroscience, Inc. to provide this declaration concerning the meaning of certain claim terms in certain patents at issue in the above-captioned consolidated case. Specifically, I have been asked to provide my opinions on how a person of ordinary skill in the art (“POSITA”) would have understood the use of the various claim terms as used in the claims of U.S. Patent Nos. 10,029,111 (“the ’111 Patent”), 8,926,490 (“the ’490 Patent”), 8,870,737 (“the ’737 Patent”), and 8,465,408 (“the ’408 Patent”) (collectively, “Asserted Patents”) that are being asserted against the Defendant in this case. In addition, I have been asked to provide my opinions as to the merits of the proposed claim construction presented by Defendant in Defendant’s Responsive Claim Construction Brief.

**I. PROFESSIONAL BACKGROUND AND QUALIFICATIONS**

2. My background and qualifications were fully set forth in my prior declarations (Dkts. 32-5 and 38-2) and are more fully set forth in my curriculum vitae, attached as Exhibit 1 to my Responsive Claim Construction brief. *See* Dkt. 38-3.

**II. STATEMENT OF COMPENSATION**

3. I am being compensated for the time I spend on this matter at my usual and customary consulting rate of \$600 per hour. This compensation is not contingent in any way on

the outcome of this case or the testimony I provide.

### **III. MATERIALS CONSIDERED**

4. In addition to relying on my knowledge and experience in the field of EEG, tES, TMS and neuromodulation, I also considered or relied upon the list of documents attached as Exhibit 2 to my opening claim construction brief (Dkt. 32-7) in preparing this Declaration and forming my opinions contained herein.

5. In particular, I have reviewed and considered the Asserted Patents, their respective prosecution histories, Defendant's Opening and Responsive Claim Construction Briefs and the Dempsey Declaration, and the other documents cited in this declaration in providing my opinions stated herein.

### **IV. PERSON OF ORDINARY SKILL IN THE ART**

6. I understand that Defendant submitted a declaration from Dr. Jared Dempsey attached to its Opening Claim Construction Brief. *See* Dkt. 34-1.

7. I further understand that Defendant cited this same declaration to support certain arguments in its Responsive Claim Construction Brief.

8. In my declaration submitted in support of Wave's response to Defendant's opening claim construction brief, I explained why Dr. Dempsey's definition of a person of ordinary skill in the art ("POSITA") is insufficient and wrong. Dkt. 38-2 ¶¶ 11-17.

9. I further explained that Dr. Dempsey does not qualify as a POSITA, under either my proposed definition or his own. Dkt. 38-2 ¶¶ 15-17.

10. I incorporate the above arguments into this declaration.

11. Additionally, I understand that since I submitted my previous declaration, Defendant has provided an updated CV for Dr. Dempsey which contains the following additional

information:

**ACTIVE RESEARCH PROJECTS**

**Study of TMS as Addiction Treatment**

Institutional Review Board: Advarra IRB # Pro00061473

6100 Merriweather Dr., Suite 600

Columbia, MD 21044

Principal Investigator: **Jared P. Dempsey**

Funding Dates: May 2022 – April 2024

Status: Data collection complete. Publication in progress.

12. I cannot determine from the above disclosure how or to what extent Dr. Dempsey was involved in the application of TMS, how he might have or have not used TMS during the project, or any other details sufficient for me to determine if he has experience with TMS or EEG. Based upon his representations to-date, in my opinion Dr. Dempsey does not qualify as a POSITA.

**V. CLAIM CONSTRUCTION PRINCIPLES**

13. The claim construction principles that I have been asked to apply are set forth in detail in my Declaration in support of Wave's Opening Claim Construction Brief (Dkt. 32-5) which I incorporate herein by reference.

**VI. TECHNICAL BACKGROUND**

14. In my Opening Declaration (Dkt. 32-5), I provided a detailed summary of the technical background of the Asserted Patents, which is incorporated herein by reference.

**VII. "IN-PHASE"/"IN PHASE" AND "OUT OF PHASE"**

15. I understand that Defendant disagrees with Wave's proposed constructions for the terms "in-phase"/"in phase" and "out of phase" as the terms appear in the '490 and '408 Patents. The Parties proposed constructions/arguments are set forth in the chart below:

<b>Claim Term</b>	<b>Plaintiff's Construction</b>	<b>Defendant's Construction</b>
In-phase/in phase  '408 Patent, Claims 1, 12 '490 Patent, Claim 1	waveforms whose peaks and troughs occur at substantially the same time.	waveforms whose peaks and troughs occur at the same time

Out of phase '408 Patent, Claims 1, 12 '490 Patent, Claim 1	waveforms whose peaks or troughs do not occur at substantially the same time	waveforms whose peaks or troughs do not occur at the same time
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It is my opinion that a POSITA would understand these terms as Wave proposed. This opinion is supported by both intrinsic and extrinsic evidence.

16. In my opening declaration, I explained that this dispute centers on whether the peaks and troughs of waveforms occur at “substantially the same time” or “at the same time”. Dkt. 32-5 ¶ 91.

17. I further explained that the intrinsic evidence supports Wave’s proposed construction. *See* Dkt. 32-5 ¶¶ 98, 102.

18. I also provided an example and explanation detailing the problem with Defendant’s use of the phrase “at the same time”. *See* Dkt. 32-5 ¶¶ 92-97. Specifically, Defendant’s proposed construction “leads to results in which waveforms that have substantially the same phase are not considered to be in phase”. *Id.* ¶ 92. I incorporate this analysis into this declaration.

19. In response, I understand that Defendant contends that Wave’s constructions, since both use the word “substantially”, “creates an overlap between” in-phase and out of phase. Dkt. 37 at \*6. Defendant further states that “it is unclear where that point of demarcation resides between” in-phase and out of phase. Dkt. 37 at \*6. Defendant further states that under Wave’s “proposal, it is unclear where that point of demarcation resides between “in-phase and “out-of-phase” – *i.e.*, at what point would two magnetic fields be in-phase (peaks and troughs *occur at substantially the same time*) and out-of-phase (peaks and troughs *do not occur at substantially the same time*).” Dkt. 37 at \*6 (I did not emphasize the above arguments. This is how the argument was listed in Defendant’s motion).

20. As I read Defendant’s arguments, it appears that Defendant believes that in-phase and out of phase operate on a continuum, *i.e.* that the terms operate as binary concepts where if waveforms are not “in-phase” they are necessarily “out of phase” and vice versa. This is an

incorrect understanding of the concepts of in-phase and out of phase as commonly understood by a POSITA, both now and at the time the patents in this lawsuit were filed/claim priority.

21. Both in-phase and out of phase are conventional terms in the scientific and engineering fields which are commonly taught to undergraduate students early in their education.

22. For example, at my university, in-phase and out of phase are taught in a circuits class taught to undergraduate students, typically during their second (software) year.

23. At the outset, both in-phase and out of phase are related to the concept of EEG Phase. I understand that the Parties have agreed to a construction of “EEG Phase” as “a measure that conveys the difference, if any, between the timing of peaks and/or troughs in two EEG signals.” As referenced in the agreed construction, EEG Phase looks at the timing of two waveform signals at a specific frequency. As used in the patents, the EEG Phase is measured in the time domain.

24. Both in-phase and out of phase require the measurement of a phase difference between two signals. Sometimes these measurements may mirror each other. However, the subsequent analyses and calculations are separate and distinct.

25. To measure a phase difference, a POSITA would measure the difference between the same point or location on two different waveforms. For example, typically a POSITA would measure the difference between peaks or troughs on the two waveforms. The measured time difference between these peaks or troughs is the phase difference and reflects how far behind one waveform is from another in time.

26. This phase difference can be transformed using standard, but complicated mathematical calculations to a degree measurement. A POSITA would typically make this transformation to normalize the measurement so that a POSITA can evaluate the measurement in context.

27. To determine whether two signals are in phase, a POSITA would compare the measured phase difference, normalized into a degree measurement, against 0 degrees. If the measured phase difference is within a few degrees of 0 degrees, a POSITA would conclude that

the two signals are in phase. In practice, the term “substantially” is often equated to having a measured difference within 1-5 degrees of 0 to be in-phase.

28. To determine whether two signals are out of phase, a POSITA would compare the measured phase difference, normalized into a degree measurement, against 180 degrees. If the measured phase difference is within a few degrees of 180, a POSITA would conclude that the two signals are out of phase. In practice, the term “substantially” is often equated to having a measured difference within 1-5 degrees of 180 to be out of phase.

29. In all other cases, the two waveforms are neither in-phase nor out of phase.

30. A POSITA would not be confused as to how to measure the above signals or determine if the waveforms are in-phase or out of phase.

31. Contrary to Defendant’s implication, the concepts of in-phase and out of phase do not exist on a continuum. As I explained above, just because two waveforms are not in-phase does not necessarily mean they are out of phase.

32. Since the concepts of in-phase and out of phase are not on a continuum, there is no need for a point of demarcation as Defendant suggests.

33. The term “substantially” also accounts for the limitations of mathematics. In an ideal mathematical sense, two brain waves are never identical. There is always some difference between two brain waves, regardless of how slight, which is dependent upon the level of precision of the measurement being used.

34. For example, if a device measuring the waveform signals is not particularly precise and provides only a reading of 1.2, two waveforms may very well look “the same” if the measurements for both waveforms are 1.2. However, if a device measuring the waveform signals is very precise, it may provide a reading of 1.234567 for the first waveform and 1.234321 for the second. Under Defendant’s proposed construction of the “same”, when a POSITA uses the less precise measuring apparatus, two waveforms would appear to be “the same”, i.e. in-phase under Defendant’s proposed construction. However, that same POSITA using the measurements taken using the more precise apparatus would have two waveforms that were not the same, i.e. out of

phase under Defendant's proposed construction.

35. For all the above reasons, as well as those identified in my opening claim construction declaration, a POSITA would understand the terms "in-phase"/"in phase" and "out of phase" as Wave proposes.

#### **VIII. CONCLUSION**

36. The opinions in this declaration are based upon the information I have received so far. I also am ready and willing to offer testimony at hearing, deposition, or trial if asked to do so.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 7, 2024.

A handwritten signature in dark ink, appearing to read "Marom Bikson", is written above a horizontal line.

Marom Bikson, Ph.D.